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HIF VNL Progress Report to DOE, April 22, 2005

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We have made progress in learning to use the code Hydra to do detailed modeling of targets for Accelerator Driven High Energy Density Physics. Hydra is a state-of-the-art 3D, radiative transfer hydrodynamics modeling code developed at LLNL. In particular, we have carried out two-dimensional simulations of a 23 MeV, 1 mm radius Neon beam striking a 48 micron thick Aluminum foil at 10% solid density, and observed the heating of the foil by the beam. The Bragg peak was chosen to fall near the center of the foil, and as expected, rarefaction waves propagated symmetrically inward (at a speed of order the sound speed), as the heated material flowed outward and cooled. Foams allow relatively high temperatures to be attained over longer timescales, and the foils behaved, at least qualitatively, as predicted by previous analysis. Design of a number of configurations, ion species, and material compositions will be carried out using this code.

Further, calculations by our collaborators at Tech-X corporation have compared results from the SRIM code (a code for understanding detailed energy deposition and scattering of ions in a cold solid) with cold dEdX curves published by Northcliffe and Schilling in 1970. The latter publication was used for making previous analytic estimates of ion energies and foil widths for experiments in which relatively large regions of uniform temperature are reached in the foil. The two sources agreed well, giving some confidence to our analytic estimates, and allowing us to rule out dE/dx discrepancies in early runs of the Hydra code that gave anomalous results. The anomalies were later found to arise from improperly set parameters in the input deck for Hydra.